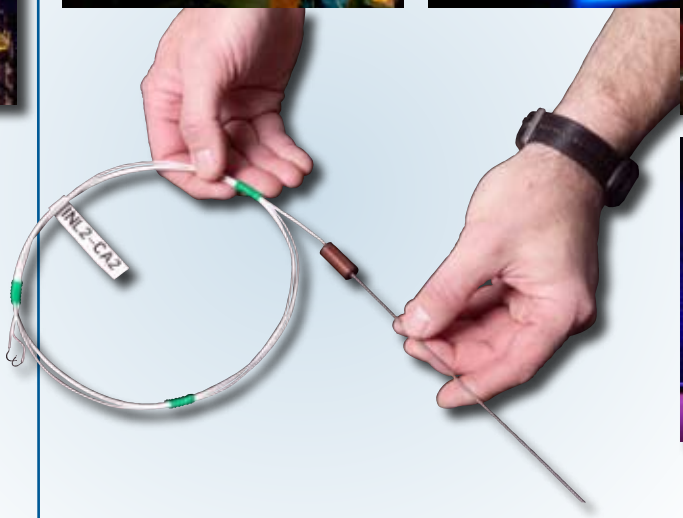
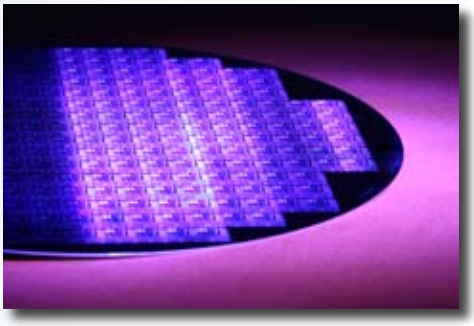
Accurate temperature measurement is critical to industries such as steel and metal fabrication, refining of chemicals, electrical power production, nuclear reactor testing and semiconductor manufacturing.





Measuring High Temperatures

High-Temperature Irradiation-Resistant Thermocouples (HTIR-TCs) are an innovative new sensor for a wide spectrum of industries.

The accurate measurement of temperatures between 1100 and 1700°C is important to safe, efficient and economical industrial operations. In such high-temperature environments, thermocouples are the most widely used industrial temperature sensors because they are rugged, affordable and accurate – at least initially.

Unfortunately, after installation commercial thermocouples are prone to decalibration or "drift," providing increasingly unreliable readings as they age. As operating temperatures and thermal cycling increase, the longevity of thermocouples also decreases. Thermocouples become brittle, often resulting in costly redundant instrument clusters, instrument failures, downtime and accidents due to undetected overheating. For radiation environments at temperatures above 1100°C, there are no thermocouples capable of continuous, reliable, and accurate operation – until now.

The High Temperature Irradiation Resistant thermocouple (HTIR-TC) is a breakthrough in the field of temperature measurement overcoming the two most critical thermocouple issues plaguing high-temperature operations—signal drift and instrument longevity. It is also the only sensor specifically designed for operating reliably in high-temperature radiation environments.

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Idaho National Laboratory

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HTIR-TC Characteristics

- Durable and reliable at high temperatures, up to at least 1700°C
- Resistant to irradiation
- Moderately priced
- Available in variety of configurations – adaptable to each application
- Easily installed
- Available NOW

In long-duration tests at INL's high-temperature laboratory, HTIR-TCs demonstrated a twenty-fold improvement over standard thermocouples which experienced up to 100 °C drift within 4,000 hours.

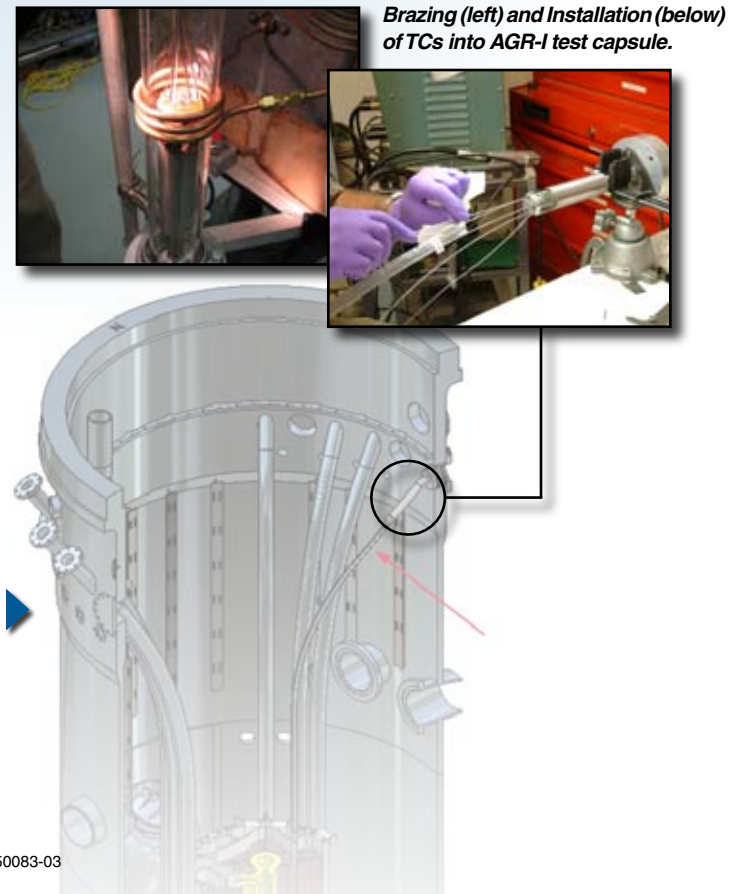
HTIR-TC Benefits

- Safer and more efficient high-temperature manufacturing processes
- Better high-temperature process control
- Enhanced energy utilization from next-generation nuclear reactors
- Improved safety monitoring of nuclear power reactors

With no existing technology on the market that can compete in reliability, temperature range and longevity of service, HTIR-TCs represent a significant improvement in high-temperature monitoring.

The Sensor Gap

Between 1100 and 1700°C, it can be difficult to find the right thermocouple, particularly for use in radiation environments. Lower temperature thermocouples are at the upper end of their optimal performance range yet higher-temperature thermocouples are at their lower useful operating range. Thermocouples that are best suited for this range suffer from drift and failures associated with metallurgical phenomena. For high-temperature nuclear research, current thermocouples are also prone to significant radiation-induced drift.



Brazing (left) and Installation (below) of TCs into AGR-I test capsule.

HTIR-TCs are being used in Advanced Gas Reactor fuel tests at INL's Advanced Test Reactor and are being considered for nuclear test reactors around the world.

For more information

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